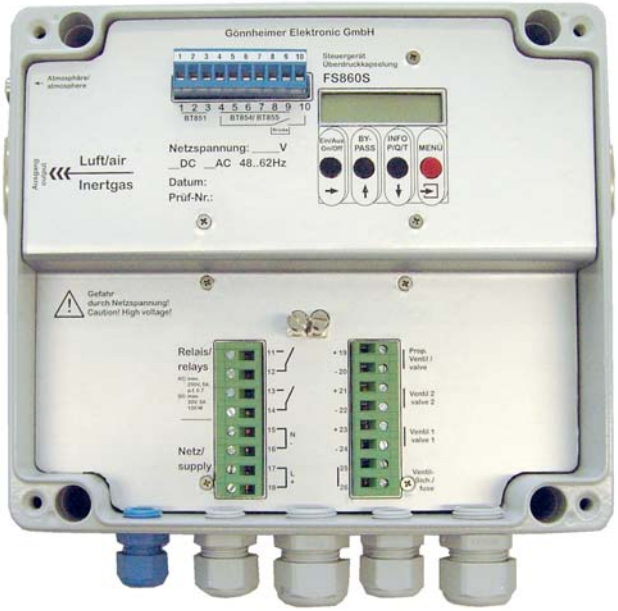
User's manual

Pressurized enclosure system

F860S



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The symbols WARNING, CAUTION, NOTE

Warning	This symbol warns of a serious hazard. Failure to observe this warning may result in death or the destruction of property.
Caution	This symbol warns of a possible failure. Failure to observe this caution may result in the total failure of the device or the system or plant to which it is connected.
Note	This symbol highlights important information.

Safety Measures: to read and to comply

Warning	Warning! Extreme caution is advised when handling this device. High electrical discharge is possible and can be fatal. Work on electrical installations and apparatus in operation is generally forbidden in hazardous locations, with the exception of intrinsically safe circuits. In special cases work can be done on non-intrinsically safe circuits, on the condition that during the duration of such work no explosive atmosphere exists. Only explosion protected certified measuring instruments may be used to ensure that the apparatus is voltage-free. Grounding and short-circuiting may only be carried out, if there is no explosion hazard at the grounding or short circuit connection.
Warning	Danger of static charge! Clean only with humid cloth! Do not open when an explosive dust atmosphere is present!

1 Operation instruction for Explosion protected device

Application and Standards

This instruction manual applies to explosion-protected devices of types below. This apparatus is only to be used as defined and meets requirements of EN 60 079 particularly EN60 079-14 "electrical apparatus for potentiality explosive atmospheres".

Use this manual in hazardous locations, which are hazardous due to gases and vapours according to the explosion group and temperature class as stipulated on the type label. When installing and operating the explosion protected distribution and control panels you should observe the respective nationally valid regulations and requirements.

General Instructions

Work on electrical installations and apparatus in operation is generally forbidden in hazardous locations, with the exception of intrinsically safe circuits. In special cases work can be done on non-intrinsically safe circuits, on the condition that during the duration of such work no explosive atmosphere exists.

Only explosion protected certified measuring instruments may be used to ensure that the apparatus is voltage-free. Grounding and short-circuiting may only be carried out, if there is no explosion hazard at the grounding or short circuit connection.

To achieve an impeccable and safety device operation, please take care for adept transportation, storage and mounting, as well as accurate service and maintenance. Operation of this device should only be implemented by authorised persons and in strict accordance with local safety standards.

The electrical data on the type label and if applicable, the "special conditions" of the test certificate BVS 06 ATEX E088are to be observed.

For outdoor installation it is recommended to protect the explosion protected distribution and control panel against direct climatic influence, e.g. with a protective roof. The maximum ambient temperature is 40°C, if not stipulated otherwise.

Terminal compartment in Increased Safety

When closing, it is to be ensured that the gaskets of the terminal compartment remain effective, thus maintaining degree of protection IP 54 according to EN 60529. Close unused entries by impact-proof stopping plugs, which are secured against self-loosening and turning.

Do not open the device in Ex area, as long the device is energized.

Inside area with explosive dust do clean the inner of the housing of the dust before closing the housing.

Maintenance Work

The gaskets of Ex e enclosures are to be checked for damages and replaced, if required. Terminals, especially in the Ex e chamber are to be tightened. Possible changes in colour point to increased temperature. Cable glands, stopping plugs and flanges are to be tested for tightness and secure fitting.

Intrinsically Safe Circuits

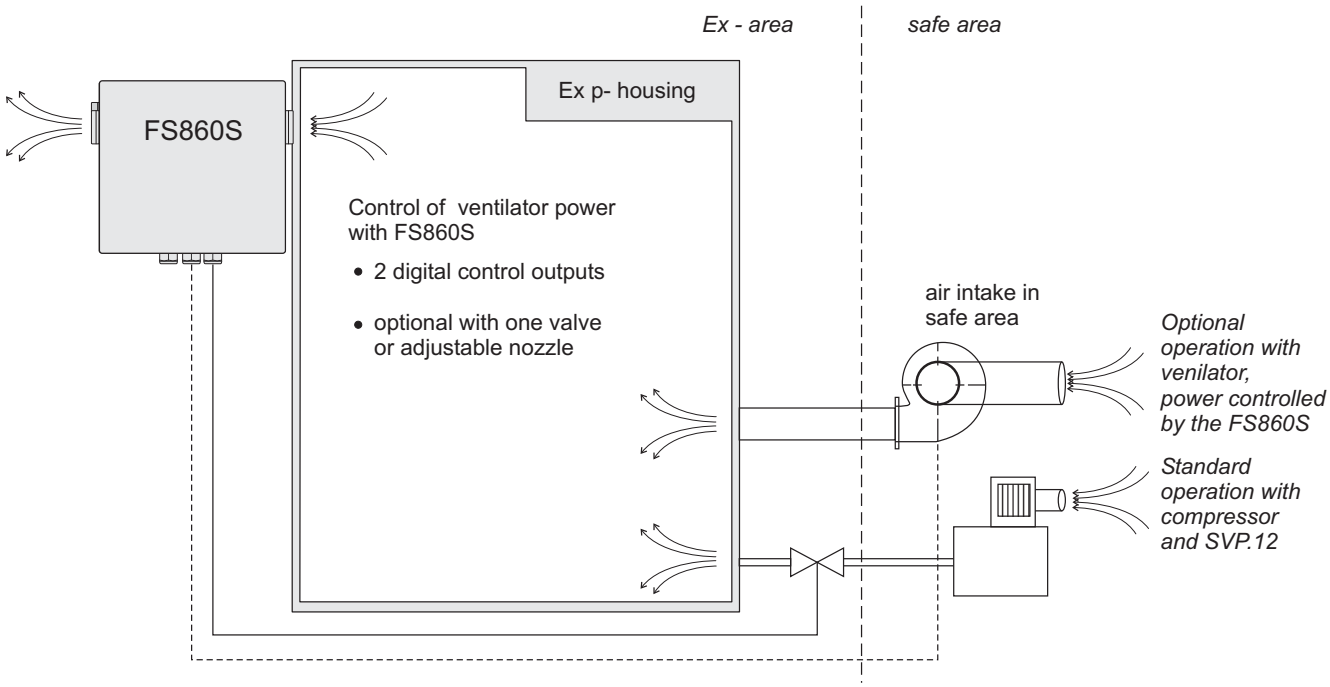
Erection instructions in the testing certificates of intrinsically safe apparatus are to be observed. The electrical safety values stipulated on the type label must not be exceeded in the intrinsically safe circuit. When interconnecting intrinsically safe circuits it is to be tested, whether a voltage and/or current addition occurs. The intrinsic safety of interconnected circuits is to be ensured. (EN 60079-14, section 12)

2 Introduction: Pressurized enclosure system F860S

2.1 Explosion protection: pressurized enclosure

The use of pressurized enclosures allows the operation of 'non explosion protected' devices in hazardous areas inside zone 1 or zone 2 area. The protection type 'pressurisation' is based on the principle of maintaining a constant pressure using air or a protective gas to prevent an explosive mixture forming near the device inside the pressurized enclosure.

Before start-up, the pressurized enclosure must be purged with air or protective gas to remove any explosive mixture that may be inside the enclosure.


Ex - area
safe area
Ex p- housing
FS860S
Control of ventilator power with FS860S
• 2 digital control outputs
• optional with one valve or adjustable nozzle
air intake in safe area
Optional operation with venilator, power controlled by the FS860S
Standard operation with compressor and SVP.12

2.2 Pressurized enclosure system F860S

The pressurized enclosure system F860S contains at least the control unit FS860S and a solenoid valve or ventilator. Each can be mounted in- or outside the enclosure. For the air supply due to the necessary amount of air (throughput quantities of up to 120 m³/h) the employment of fans is recommended. The point of sucking air in of these must take place in the safe area!

Furthermore, an operator panel is available for remote control. It is also possible to connect intrinsically safe peripherals (e.g. temperature, pressure sensors, switches) to the control unit FS860S.

The pressurized enclosure system F860S can be configured in two different modes: Pressurization with leakage compensation and pressurization with continuous flow of protective gas.

2.2.1 Mode pressurization with leakage compensation

After purging, the control unit FS860S holds the pressure inside the enclosure at a minimum of 0,8 mbar (80 Pa). Two different solenoid vale techniques are available: digital working solenoid valve (SVD) technique or proportional working solenoid valve (SVP) technique.

a) Digital solenoid valve technique

While purging, the SVD is activated and a large amount of purge medium flows into the enclosure through a nozzle with a large cross section. After purging, the control unit turns off the SVD.

The leakage compensation is done by a bypass choke, with a very small adjustable cross section (diameter 12 mil (0.3 mm) up to 40 mil (1 mm), inside the valve. The protective medium flowing into the enclosure is adequate to maintain a pressure of at least 0,8 mbar (80 Pa). The pressure is monitored by the control unit FS860S by a proportional working pressure sensor. The maximum and minimum pressure of the enclosure is programmable within the configuration menu.

Note

If leakage losses grow up (e.g. by aging of cabinet's seals) and cannot be compensated by the bypass, the enclosure will be shut down!

For purging, a conventional (time based) as well as an improved integrating purging method (integration of real flow) are available:

1. Using the conventional method, the purge quantity is based on the product of a monitored minimum flow rate at the enclosure outlet and time. The flow rate depends on the size of the valve's nozzle (diameter 40 mil (1 mm) ... 320 mil (8 mm)) and prepressure. This has to be calculated using a formula or a pressure-nozzle diagram.

   The conventional purging method using a digital valve has a considerable disadvantage: During purging phase and also while normal operation, a constant rate of protective gas is needed. For getting system availability, the inflow rate has to be selected bigger than the leakage losses of the enclosure.

Note

Inflow volume – leakage losses of cabinet > preselected minimum flow rate!

Wastage of protection gas will pollute environment and cause high costs during application's life time!

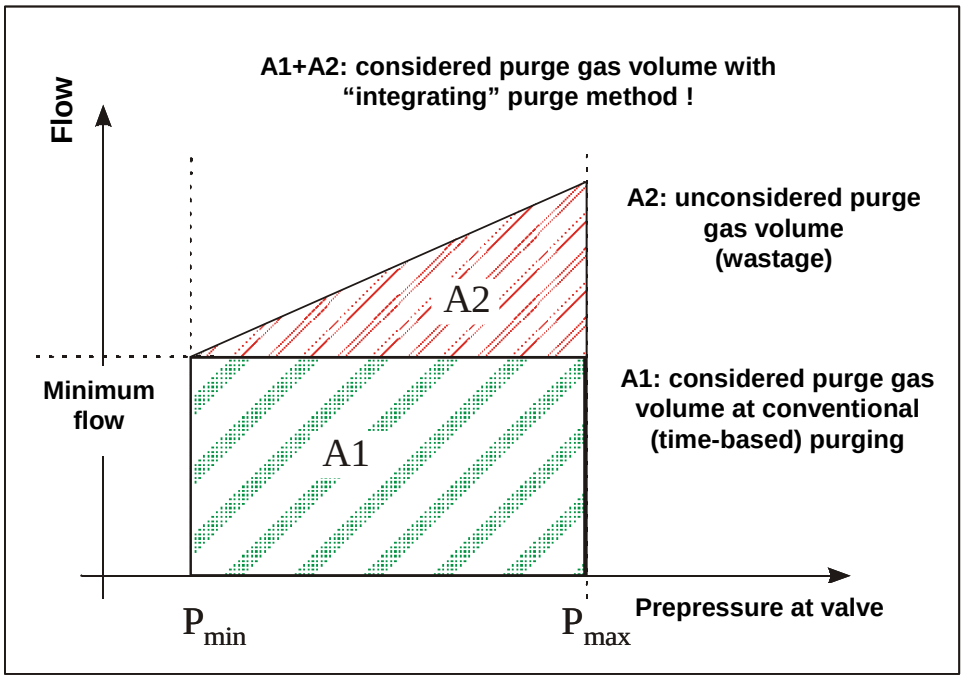


Figure 1: Wastage of protective gas by detection of flow threshold and fixed purging time.

2. Using the **improved integrating purging method,** the FS860S unit measures the real flow rate at the enclosure outlet and integrates the signal to get the real purged volume. Additionally, a minimum flow rate is monitored to ensure a safe purging phase. If the flow rate sinks below the minimum, the integration will be stopped and continues automatically by rising above the minimum.

Increased inflow volume into the cabinet automatically leads to a shortening of time for purging when using the integrating purge method.

This fast and efficient purge method enables shortest start-up times!

b) Improved proportional solenoid valve technique

The internal proportional working pressure sensors also allow the use of a proportional solenoid inlet valve. This valve is used as the actuator of a digital-working FS860S PID-control loop for the inner pressure of the cabinet.

The benefits of pressure feedback control are:

1. Dramatically decreased consumption of purge gas.
2. Increased availability of the application, based on constant pressure inside Ex-p-housing; higher leakages e.g. by aging of gaskets etc. will be compensated.
   → Adaptive compensation of leakage losses of the Ex p encapsulation!
3. Minimization of streaming noise.
4. Easy adjustment of pressure levels to specifications of Ex-certificate.

Further advantages are:

1. Exact regulation of pressure also during purging phase.
2. Due to defined pressure inside cabinet, pressure sensible parts like foil keyboards, windows etc. will not be damaged.

Increased system availability by PID controlled cabinet pressure!
Pressure sensitive parts (e.g. windows, front foils) will be protected.

2.2.2 Mode pressurization using continuous flow

The control unit FS860S also supports the operation mode „continuous flow“. This operation mode is used, for so called “containment systems”, where flammable gases or liquids will be emitted into the inner of the cabinet during normal operation (e.g. at analysers).

After the purging phase, a continuous, PID controlled flow rate will be kept during normal operation. This continuous flow rate is used for dilution flammable gases or vapours below their “lower explosion concentration”.

As during integrating purging method, an adjustable minimum flow rate will be monitored additionally.

2.3 Peripherals

2.3.1 Operator panel BT851

For the control unit FS860S an optional operator panels for remote control and visualization is available. The panel is based on the explosion protection class 'intrinsically safety' and offers an improved operator access when the FS860S control unit is mounted inside the cabinet.

The operator panel BT851 indicates operation and malfunction status as plain text via LC-display. Four front-sided push-buttons offer total command of the FS860S unit. Status, momentary pressure, flow rate as well as remaining purge volume/time are available. The connection to the control unit is based on serial communication, using only 3 wires (max. distance 20m).

2.3.2 Disconnector unit SR852 and SR853

According to EN 50016 all non- intrinsically safe connections of the ignition capable apparatus must be disconnected, if the protection gas pressure falls below the safety limit.

In many applications more than the two connector terminals on the control unit FS860S are needed. In these cases the disconnector unit SR 852, with 8 or opotional 16 galvanically separated connectors (switching power 250V, 5A) is available.

The S853 provides 4 galvanically separated channels with a switching power of 400V, 16 A, separates 4 channels. It can be used e.g. to switch of 3 phase networks.

2.4 Conformity with standards

The explosion proof device **Fehler! Unbekannter Name für Dokument-Eigenschaft.** meets requirements of listed standards in the attachment (Declaration of conformity). They were developed, manufactured and tested in accordance with state-of-the-art engineering practice and ISO9001:2008.

3 Installing the unit/ Getting started

This chapter contains important steps for mounting, connecting and starting.

3.1 Requirements to the cabinet

The cabinet must meet at least protection class IP54.

The system F860S is suitable only for housings with a volume of more than 1000 liters.

For smaller housings the overpressure system F850S is to be used.

3.2 Mounting

3.2.1 Control unit FS860S

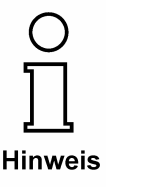
The control unit FS860S can be placed directly inside hazardous area. The location (inside or outside the enclosure) as well as the position is variable and can be fitted to customers specific requirements. If possible, arrange the in- and outlet of the control unit on a horizontal axis. See also Figure 15 in the Appendix.

The control unit can be fitted to the cabinet or to a mounting plate using the 4 integrated, rear sided fixing points. In most applications, a fixing with the 2 inch screw connection of inlet or outlet is sufficient.

The in and Outlet of the FS860S should be arranged on an horizontal axis.

Watch local safety guidelines and EN60 079-14

The solenoid inlet valve(s) should be mounted as far away from the control unit FS860S as possible, to achieve safe purging! (E.g. diagonal arrangement, see Figure 15).



If a pipe work system must be attached to the inlet or discharge opening of the control unit FS860S, it is important that the inside diameter is bigger than the orifice plate diameter x 1,5 at least.

Further the pipes should be kept as short as possible.

3.2.2 Solenoid valves

Mounting position of solenoid valve is free. It can be mounted inside or outside the cabinet. For mounting hints, see additional manufacturer's guide of solenoid valve.

Hinweis

The proportional SVP.12 valve is medium supported and must contain a nozzle with 8 mm diameter at the output.

Hinweis

The compressed air supply must ensure a pressure of 2-3 bar directly at the valve. This pressure must be delivered constantly also at a flow rate of 1200 liters per minute!

3.2.3 Operator panel BT851

The operator panel BT851.0 can be integrated directly into the enclosures outer skin. The BT851.5 has a separate housing for mounting on a plate or wall. For location and drill sizes see Figure 13 Dimensions and templates of BT851 are shown in the annex.

3.2.4 Disconnector units SR852 and SR853

The disconnector units SR852 and SR853 can be mounted and operate in hazardous area zone 1. They use integrated Ex-e terminal boxes and clamps.

3.3 Connecting and Commissioning

After mounting the FS860S, connect the power supply lines, the valve lines and other non- intrinsically safe lines to the terminals 11-24 into the explosion proof enclosure of the control unit FS860S.

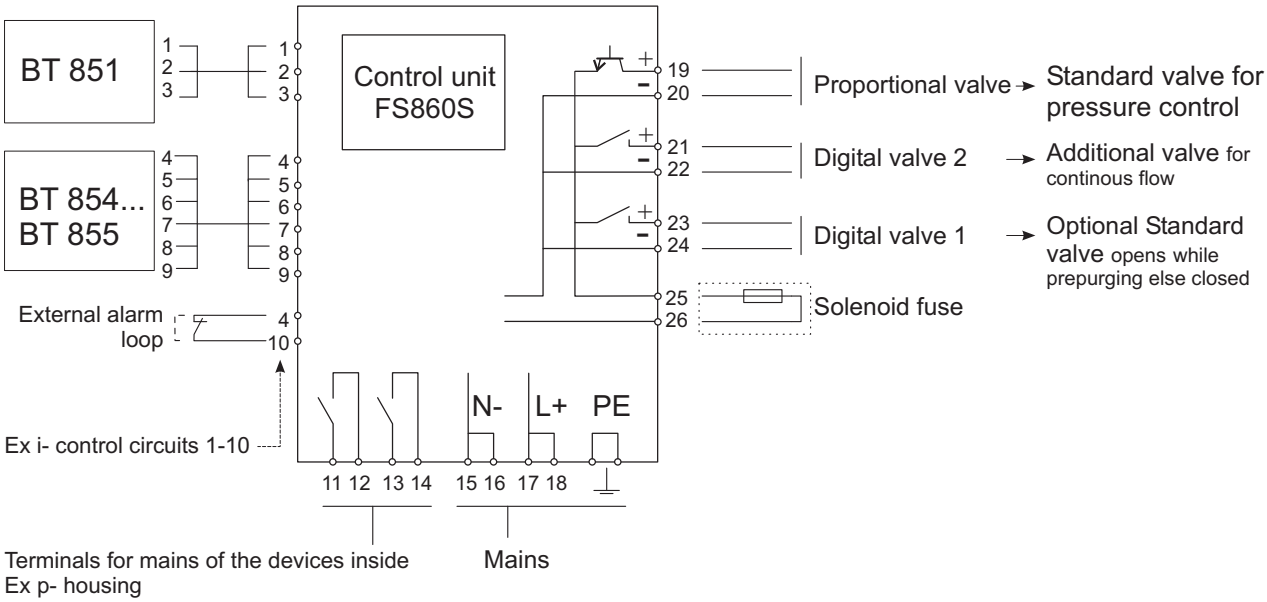


Figure 2: Block diagram FS860S

3.3.1 Connection details

Warning

HIGH VOLTAGE!

Beware of high voltages and currents when handling this device or power lines!

Electric shocks can injure or kill!

Caution

Ensure your installation is compliant to the following: EN60 079-14, certification and description documents of FS860S.

Do not exceed terminal safety limits of each terminal.

See limits in technical details or declarations of conformity.

Note

If an external key switch is used for enabling the bypass function, it can be helpful to set the bypass code at the FS860S to 9999 to prevent a secondary bypass function by bypass code from the control unit.

The external key switch for the bypass function has to be connected to terminals 4 and 5 of the FS860S.

Note

It is possible to switch on and off the internal devices of the cabinet using the On/Off key at the FS860S control unit or at the BT851 operator panel. If this function should not be used, it is possible to short cut terminals 4 and 6 of the FS860S, to enable an automatic power on after purging phase.

In this case, the On/Off-buttons at the control unit FS860S and BT851 are disabled.

3.3.2 Terminal description

Terminal		Description
FS860S	BT 85x SR 852	
1 2 3	1 2 3	Terminals exclusively for connecting the operating panel BT 851
4 5 6 7 8 9	4 5 6 7 8 9	Terminals of operating panel BT 813, BT 814 and BT 815
4 10		External alarm loop (intrinsically safe), opening circuit alarms EEx p-System and switching off ignition-capable device.

Terminal FS860S	Description
11,12	Working current circuit 1
13,14	Working current circuit 2
15,16	Line voltage, neutral conductor
17,18	Line voltage, outer conductor at AC
19,20 +,-	Terminals for proportional solenoid valve

21,22 +,-	Terminals for additional digital solenoid valve 2
23,24 +,-	Terminals for digital solenoid valve 1

3.3.3 Power off relays

Warning

The maximum current limits (5 A) on the clamps 11,12 and 13,14 should not be exceeded at <u>any time</u>!

E.G. By an application of switched power supply a multiple higher current as the nominal max. current may occur. In this case a switching on current limitation (e.g., NTC) must be added to avoid the off-limits high current.

If this is missed the risk of the „jammed relay contacts“ and within the loss of the explosion protection exists!!

3.3.4 Commissioning and parameter defaults

The following parameters are preset after connecting the FS860S to mains supply for the first time or after a reset of the control unit:

	Parameter	Display	Comment
Language	Deutsch		
Structure	Mode: leakage compensation Type of valve: proportional		
Pressure and flow	Purging volume Min. flow while purging Min. pressure inside enclosure Max. pressure inside enclosure Set-point pressure while purging Set-point pressure while operating Signal pressure	000500 l 0.9 l/s 0,8 mbar 15 mbar 10 mbar 2.0 mbar 0,8 mbar	 Shut down value for integration Shut down values (limits) for pressure inside housing Only at optional signalling contact
Codes	Main menu (M-Code) Bypass (By-Code) On/Off-Code (On/Off-C.)	0001 0002 0001	The setting 0000 disables the code protection (not possible at M-Code) The setting 9999 disables bypass button at FS860S and BT851

3.3.5 Reset

Note

Hold red *ENTER-Button* down, while powering on the FS860S to reset all parameters to default values in table Fehler! Verweisquelle konnte nicht gefunden werden..

The Reset can not be made using the BT851!

3.3.6 Automatic Purging process

The control unit FS860S starts the purging process immediately after start up, if the minimum pressure of 0,8 mbar (80 Pa) can be built up inside Ex p cabinet.

Minimum pressure and minimum flow rate will be monitored simultaneously to ensure a safe purging process.

If the purging flow rate drops below its minimum (e.g. temporary interrupt of air supply or temporary shut of the outlet), the purging process will be interrupted and the control unit continues purging, after the disturbance is removed. If purging pressure exceeds the min or max limits, the purging process will be terminated and the control unit will restart with a new purging process automatically after achieving purging conditions.

The table below shows the minimum flow rate in accordance of the used orifice plate.

Orifice plate in control unit	Monitored minimum flow rate
∅ = 0.98 inch (25 mm)	6 liters /sec.
∅ = 1.18 inch (30 mm)	12 liters /sec.

3.4 Maintenance

Depending on the cleanness of the used purging gas, the pneumatic inlet and outlet parts of the FS860S as well as the solenoid valve have to be checked regularly for pollution by e.g. oil, dust, etc. or corrosion to ensure a safe work of the application.

3.5 Repairs

Warning

Repairs or maintenance at the FS860S or its peripheral parts may only be done by Gönnheimer Elektronic GmbH.

4 Operation

The user can interact with the FS860S purge control unit via the four front sided push buttons and LC- display respectively by using the external operator panel BT851.

4.1 Display

The built-in display indicates menus, operation modes, present pressure or flow rate data, as well as malfunction.

4.2 Keyboard

The four front sided keys have different functions depending on the present mode of operation.

Key	Mode	Function
On/Off *„Shift right"-button*	normal operation running menu	Toggles the cabinet's electronic devices on and off, if purging system state is ready Shift cursor one position to right.
BYPASS *„Up"-button*	normal operation **Warning** running menu	Activates Bypass. **Only for maintenance of the cabinet! Only allowed if no hazardous atmosphere is present!** Get menu next item
INFO /P/Q/T *„Down"-button*	normal operation running menu	Changes information shown on the display: present pressure, flow rate, remaining purge time respectively purge volume and present state of the purging system. Get previous menu item
MENU *„Enter"-button*	normal operation running menu	Enter or leave menu Initiates and confirms parameter input

4.3 How to enter and leave the bypass mode

Warning

Only for maintenance of the cabinet!

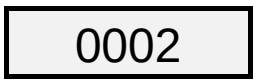
Set bypass only if no hazardous atmosphere is present inside or around the cabinet!

The bypass mode is denied, if it is possible that an explosive atmosphere can arise inside the Ex p- cabinet! (e.g. at containments systems)

It is possible to enter bypass mode in each operation sate of the control unit. The origin state is normal operation.

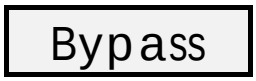
Press *„Up“-button*

Enter the bypass code using the “up”, “down” and “shift right” button.



The ex works bypass code is ‘0002’.

Confirm the right bypass code using the *ENTER*- key.



The bypass mode is now active.

Or

If the control unit is set to “automatic on” the display toggles between “bypass” and “On” and the relay contacts (Terminals 11,12 and 13,14) are closed.

Leaving of bypass mode is done by the same procedure.

Note

If the bypass was activated in normal operation (leakage compensation), the FS860S remains in bypass mode until it reaches the set point pressure inside the cabinet in 10 seconds.

Alternative to the use of the push buttons, the bypass mode can be called by using a key switch between intrinsically safe terminals 4 and 5.

4.4 Information during normal operation

The FS860S can give several information to the user during different sates of operation via the LC-display.

You can choose between the following information items: state, current pressure-, flow rate-, or remaining purge time- indication using the “down/INFO”- button (see figure below).

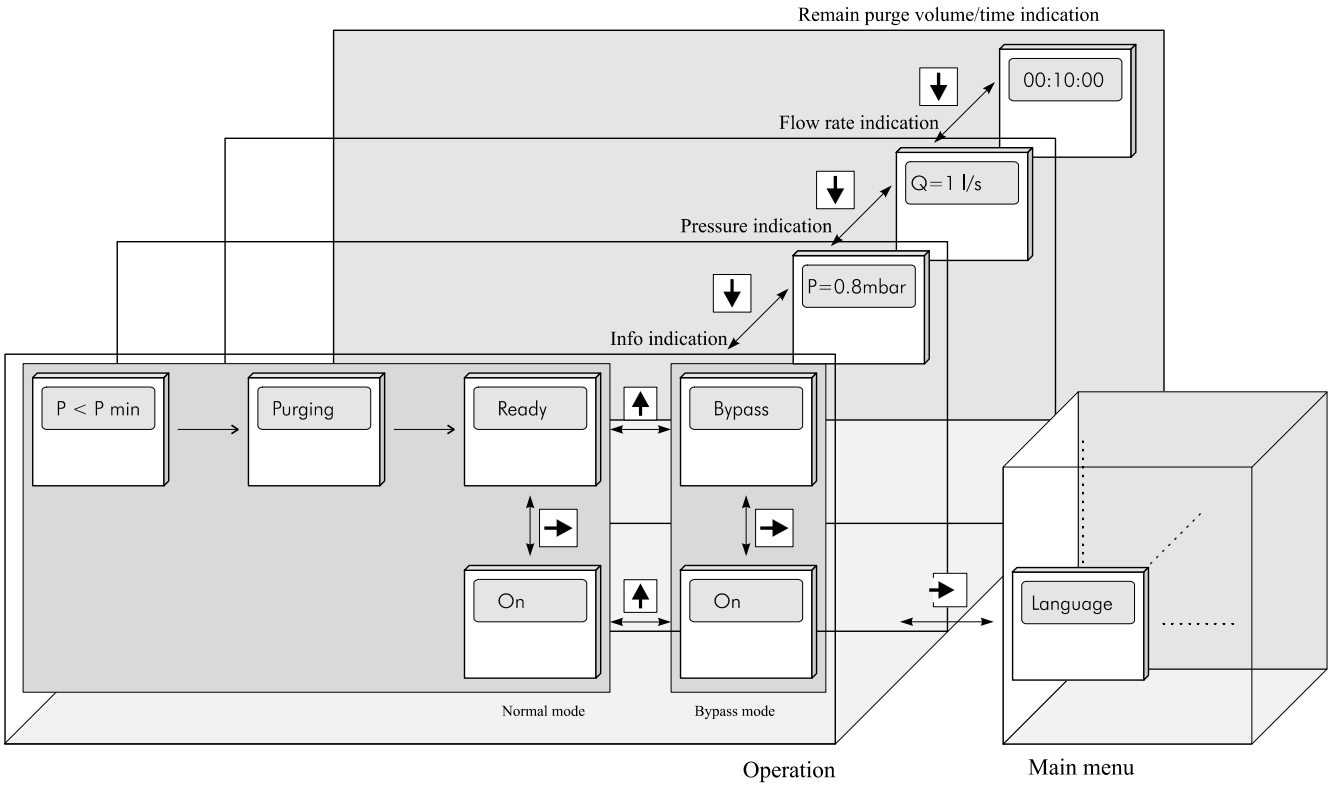


Figure 3 Flow chart: states of purging system and corresponding display

4.5 Configuration

To achieve an application specific mode of operation, the control unit FS860S has to be configured, entering the following parameters.

All parameters of the control unit are structured in form of a menu. See also the flow charts in chapter 5.

4.5.1 The menu structure

Main menu The main menu is separated into 4 categories:

- Language
- Structure
- Parameters
- Codes

Language The standard device contains the following languages:

- German
- English
- French
- Dutch
- Spanish

Structure The purge system structure can be selected as follows:

- Operation mode: *leakage compensation* or *continuous flow*
- Valve type: *digital* or *proportional* solenoid valve
- Purge method: *Integrating* or *time based*

Parameters This category contains the necessary parameters depending on the defined structure above. Examples for parameters are:

- Purging volume/time
- Minimum flow while purging process
- Minimum pressure
- Maximum pressure
- Signal pressure

Codes The control unit has 3 different code words:

- M-Code: to enter main menu
- By-Code: to activate Bypass
- E/A-Code: to switch encapsulated components on or off

Note

The FS860S enters stand by mode while running menu structure. That means: the solenoid valve is closed and the encapsulated components are switched off.

4.5.2 Description of the menu items

The display of the control unit contains 8 digits. All names of structures and parameters will be shown in clear text or abbreviations.

The table below shows some explanation of the menu items. The table can be used as a reference guide for programming the FS860S correctly.

See also corresponding flow charts in section 5.

Hierarchy			
1.Level	2.Level	3.Level	Description, Explanation
Structure	Valves	P-Valve	Selecting 'valves' specifies weather a ***proportional solenoid valve*** or a
		D-Valve	***digital solenoid valve*** is connected.
	Integra.	Integ. Y	***Integrating purging method, Yes*** Chooses integrating purging method.
		Integ. N.	***Integration Purging method, No*** Selects time based purging method.
	Cont.Flow	C. Flow Y.	***Continuous Flow, Yes*** Activates the operation mode 'continuous flow'.
		C. Flow N.	***Continuous Flow, No*** Activates the operation mode 'leakage compensation'.
Param.	Pur. Time	.....	***Purge time -*** Enter a fixed purge time in h/min/sec. (The purge time only appears, if the time based purging method is chosen)
	Pur. Vol.	.....	***Purge volume –*** Enter a fixed volume in litres. (The purge volume only appears, if integration purging method is chosen; e.g. 5 x cabinet volume)

	Min.Fl. P.	.....	***Minimum flow rate** during **purging phase***
	Min.Fl .O.	.....	***Minimum flow rate** during **normal operation (only at continuous flow)***
	Rated Fl.	.....	***Flow rate set-point*** - At operation mode 'continuous flow' this flow rate will be regulated, while normal operation.
	Min.Pres.	.....	***Minimum pressure inside enclosure*** Only values above ≥ 0,8 mbar can be entered.
	Max.Pres.	.....	***Maximum pressure inside enclosure*** Maximum pressure ≤ 15 mbar
	R. Pre. Pu.	.....	***Pressure set-point*** during ***purging,*** This pressure value will be regulated during purging process.
	Rated Pr.	.....	***Pressure set-point*** during ***normal operation,*** This pressure value will be regulated during normal operation.
	Sig. press.	.....	***Pressure set-point*** , at under-run of this value, the signalling output relay opens (terminals 21,22).
Codes	M-Code	.....	***Menu code -*** Code to enter menu and leaving normal operation mode. The M-code could not switched of by setting M-Code =„0000"!
	By-Code	.....	***Bypass code -*** Code to activate the bypass. The bypass code can be switched off by setting „0000". The bypass code „9999" blocks the bypass function. In that case a bypass can only be activated by key switch connected to intrinsically safe connectors 2.1 and 2.2.
	On/Off-C.	.....	***On/ Off code***, enables switching on or off the encapsulated devices. The On/Off code word can be switched off, entering „0000".

4.5.3 Configuration Example

Example-
Ex p-System

⇒ Enclosure volume: 1500 l

⇒ Language : English

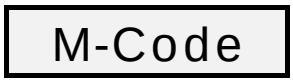
⇒ Structure :
- Operation mode: leakage compensation
- Proportional solenoid valve

⇒ Parameters
- Purging volume: 7500 l
- Minimum pressure of enclosure: 0,8 mbar (80 Pa)
- Maximum pressure of enclosure: 15 mbar (1500 Pa)
- Set-point pressure purging process: 10 mbar (1000 Pa)
- Set-point pressure normal operation: 2 mbar(200 Pa)

⇒ Codes
- M- Code: 0001
- By-Code: 0002
- E/A-Code: 0000 (switched off)

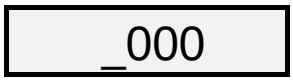
Procedure:

Press the "*Enter"-button* to start main menu. The control unit calls for the M-code to be entered.

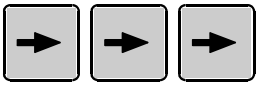


The ex works M-code is '0001'.

Press the "*Enter"-button* to enter M-Code.

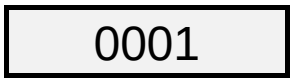


Display shows '0000', the far left digit is flashing.



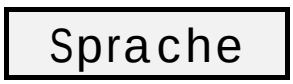
Use right key to step between the digits.

to enter code '0001',



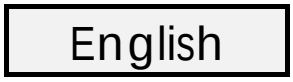
(the present M-Code).

Confirm the code input by pressing "*Enter"-button*



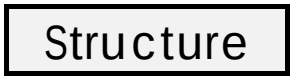
The main menu is active now. The first sub menu 'Language' appears on the display. The default language of ex works is German.

To alter the language, press "*Enter"*.



On the left appears the word 'English

Press the "*Enter"-key* to confirm.



Category 'Structure' appears.

Press the “*Enter”-key* to configure the Ex p-system structure.

Valves

The first item of the structure menu is the choice of the solenoid valve.

Press the “*Enter”-key* to change state.

D-Valve

The present state is digital solenoid valve.

Change the state by pressing “*Up”-key* -

P-Valve

The new state is now ’Proportional solenoid valve’.

Confirm the change by pressing “*Enter”-key.*

Cont.Flow

This item is the operational mode 'continuous flow' or 'leakage compensation'. The ex works state is 'leakage compensation'.

So skip this item by pressing the “*Up”- key.*

Param.

The structure menu is now finished. The main menu automatically continues with the pre-selected parameters.

Start the parameter category by pressing the “*Enter”- key*.

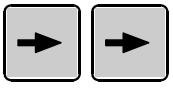
Pur. Vol.

The first menu item ‘Purging volume’ appears.

Press the “*Enter”- key* to enter the desired volume of ‘7500 l’.

_00500 l

To enter ‘7500 l’, use the input sequence as follows:



00_500 l

007500 l

Confirm the input by pressing the “*Enter”- key.*

Min Fl. P.

The minimum flow while purging can be increased for special applications. In the sample, the default value should be kept.

Min.Pres

The desired minimum pressure of 0,8 mbar (80 Pa) is already adjusted ex works. Continue skipping this menu item by pressing the “*Up”- key* or indicate it by pressing the “*Enter”- key.*

Max.Pres.

Now enter the desired value for the maximum pressure. Modify the present parameter as shown above.

15 mbar	The desired maximum pressure is 15 mbar (1500 Pa)
R. Pre. Pu	The desired set-point pressure during purging process of 2 mbar is already adjusted ex works. Continue passing this menu item by pressing the "*Up"- key.*
Rated Pre.	The desired set-point pressure during normal operation must be adjusted. Modify the present parameter to 2 mbar (200 Pa) as shown above.
Codes	The parameter setting is completed now. The main menu continuous automatically with the sub menu codes.
M-Code	Modify M-Code to '0001' as shown above. Please note: the **M-Code cannot be set to '0000'.**
By-Code	Modify bypass code to '0002' as shown above.
On/Off-C.	Set the on/off code to switch the encapsulated devices on or off to '0000'. This code is disabled from now on.
End	The main menu settings are now completed.
	After pressing the *Enter- key,* the purging system is ready for operation.

4.6 Alarm and malfunction indications

Alarm	*Cause*	*Actions*
Ext.Alar	The external alarm occurred, i.e. the external alarm loop is broken or activated by an additional safety device.	(If the external alarm loop is not used, disable the external alarm loop by a shorting bridge)

Error message	*Cause*	*Remedy*
Error E.	EEPROM Read Error Stored configuration data is incomplete or corrupt.	Restart the FS860S. If the error remains, the unit has to be checked by manufacturer.
Error P.	Pressure sensor Error The integrated pressure sensors do not work properly	Turn FS860S off. Turn FS860S on. If the error message occurs again,
Error F.	flow sensor Error The integrated flow sensors do not work properly	then return the control unit FS 860S to Gönnheimer Elektronic.
Error C.	Hardware - fault	

5 Flow charts

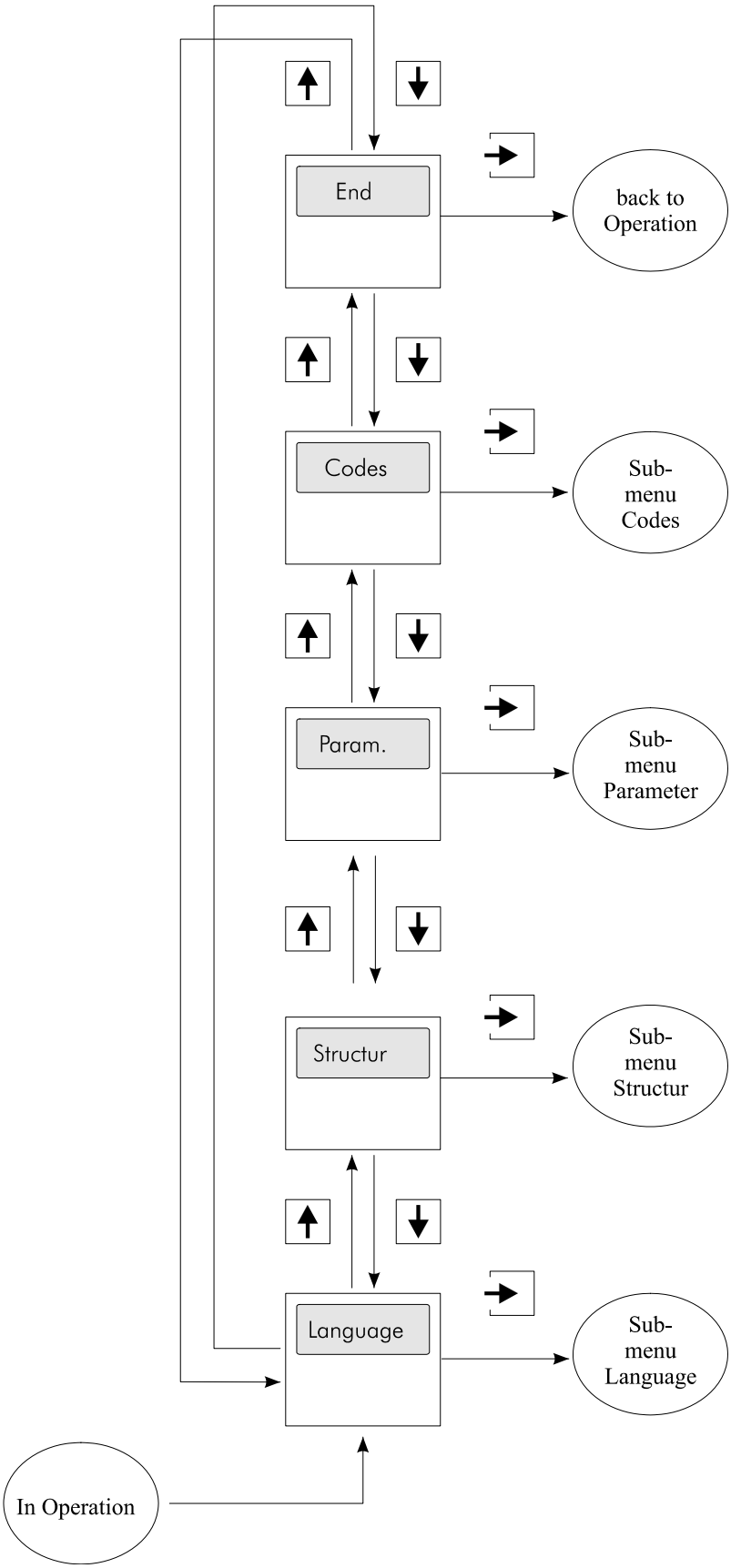


Figure 4 Flow chart: main menu

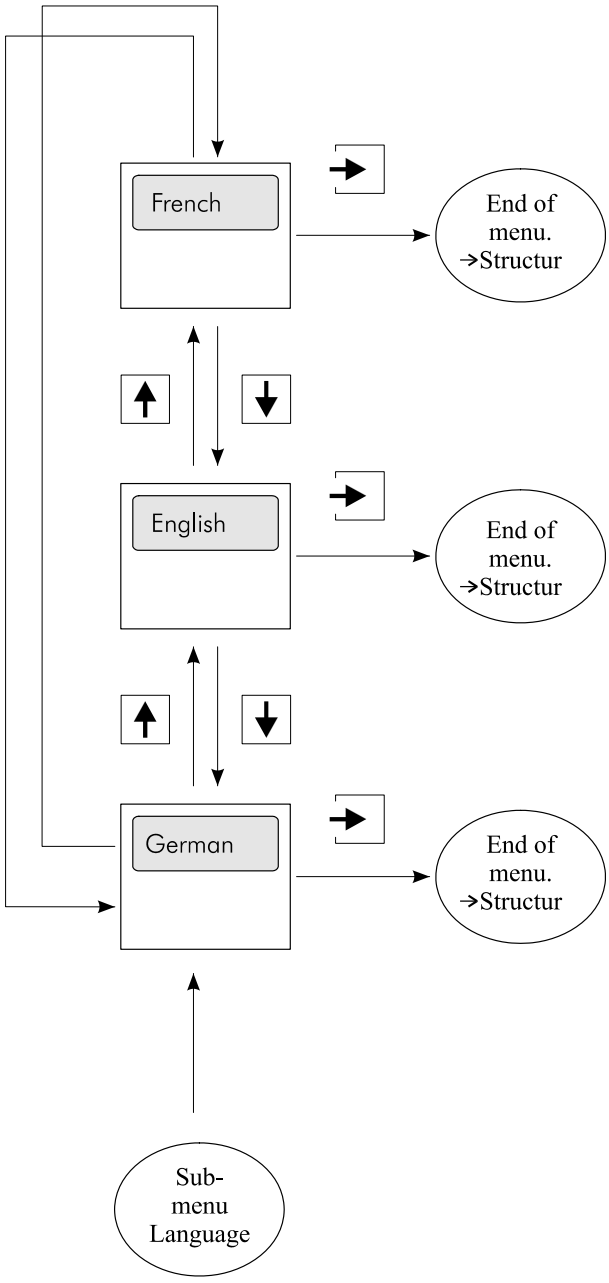


Figure 5 Flow chart: language menu

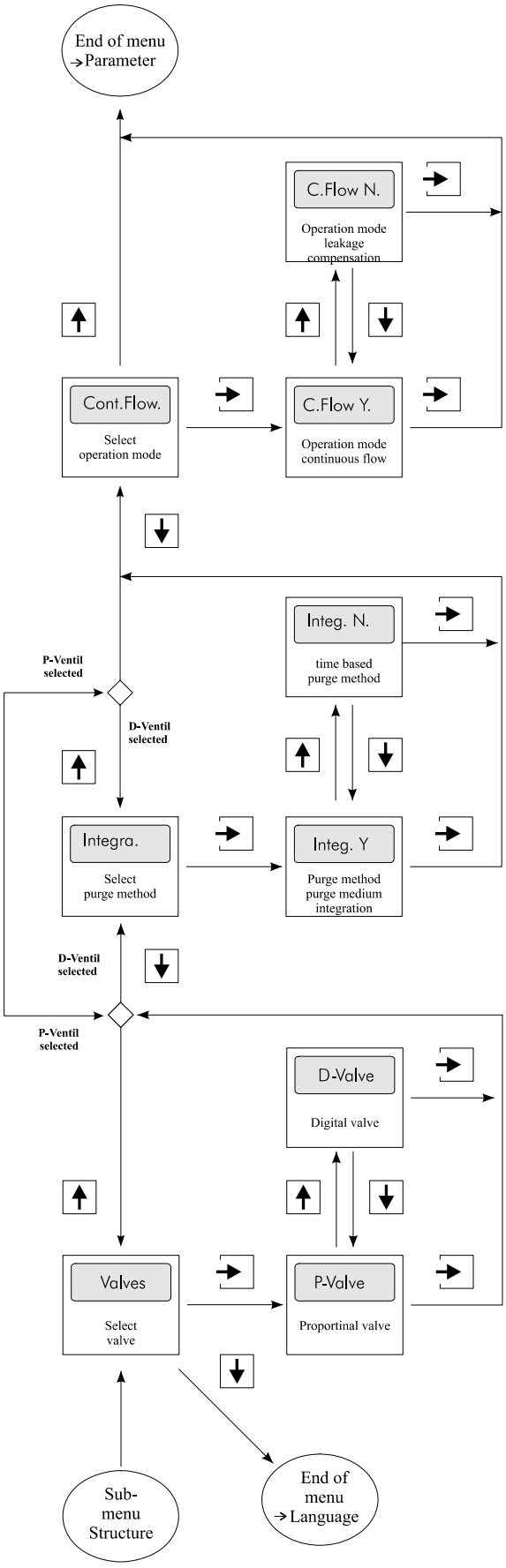


Figure 6 Flow chart: structure category

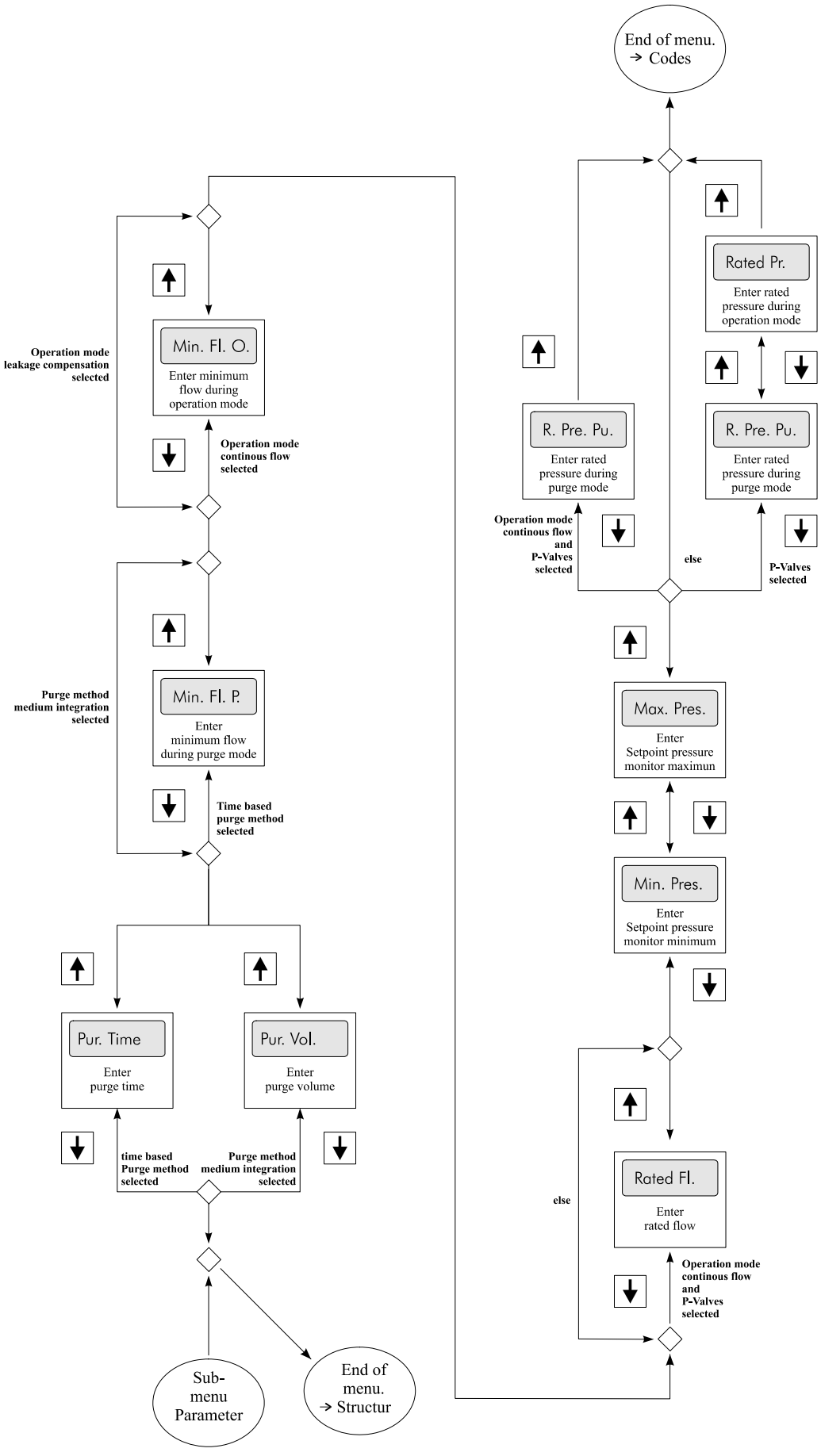


Figure 7 Flow chart: parameter category (signal pressure is missing)

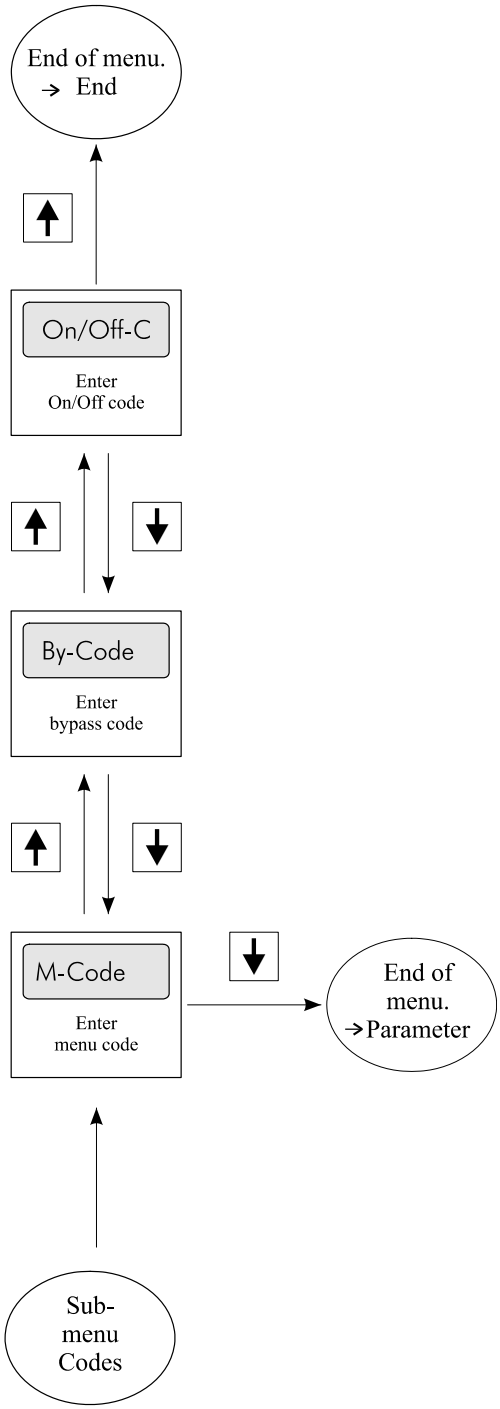


Figure 8 Flow chart: code category

6 Annex

6.1 Tables

Size of orifice plate

Orifice plate in control unit	Monitored minimum flow rate
∅ = 0.98 inch (25 mm)	6 liters /sec.
∅ = 1.18 inch (30 mm)	12 liters /sec.

Flow rate [l/s]			
Nozzle:	6 mm	8 mm	10 mm
2 bar	13,5	24,0	37,5
4 bar	20,7	36,8	57,5
6 bar	26,6	46,3	72,3

The right diameter of the orifice plate depends on the desired flow rate through the enclosure. In case of digital solenoid valve, the flow rate is mainly given by the built in nozzle diameter and prepressure.

6.2 Technical Details

		Control unit FS860S
General	Mounting	inside hazardous area
	Ex-protection class	2 II G, EE e m [ib] IIC T6
	Environment protection	IP65
Housing	Dimensions [mm]	H x W x D: 202 x 232 x 111
	Material	Aluminium, lacquered, light grey (RAL 7035)
Electrical specifications	Power consumption	About 2.5 VA (without peripherals)
	Main voltage	230V AC *optional*: 110V AC, 120V AC, AC 48 ... 62 Hz 24V DC
	Working circuits Terminal 11, 12, 13, 14	AC: U ≤ 250VAC, I ≤ 5A at cos φ > 0,7 DC: U ≤ 30 VDC, I ≤ 5 A, P ≤ 150 W
	Control circuits, Plugs for peripheral components	Ex protection class: intrinsically safe, see EC type certificate for further details
	Min. and max. clamping torque	min. 0,3 Nm max. 0,4 Nm
	Min. and Max. wire cross- section	steep: 0,2 – 2,5 mm² flexible: 0,2 – 2,5 mm²
Pneumatic	Pressure range	0 ... 18 mbar(0 .. 1800 Pa)
	Flow rate range	6 .. 30 l/s, dependent upon orifice plate size
Mounting	Position	Position independent, only intake and outlet of the control unit should be lined up on a horizontal axis.
	Environment temperature	-10°C ...+50°C at T6 -10°C ...+60°C at T4
	Humidity	5-95%, non-condensing
Ex p Configuration	Parameter input	LC-Display, menu guided Different languages : German, English, French, Dutch, Spanish
	Parameter storage	by EEPROM double saved with CRC

6.3 Marking

Marking of type FS860S:

Ex	II 2 G Ex e mb [ib] [px] IIC T6	-20°C ≤ T_A ≤ +45°C
	II 2 G Ex e mb [ib] [px] IIC T4	-20°C ≤ T_A ≤ +60°C

Marking of operator panel BT851:

Ex	II 2 G Ex ib IIC T6
	II 2 D Ex ibD T80°C

6.4 Type code

Control unit FS850S		**.**	**.**
Mains voltage:	230 VAC	**.0**	
	120 VAC ……	**.2**	
	24 VDC	**.6**	
Plate orifice:	4 mm, range 0.5 ...1,1 m^3/h		**.0**
	6 mm, range 1.1 ...2,7 m^3/h		**.2**
	10 mm, range 2.5 ...6,5 m^3/h ...		**.4**
	14 mm, range 6 ...11 m3/h		**.6**
	18 mm, range 9 ...15 m3/h		**.8**

More voltages on demand;

Accessories: Additive window in control unit (recommendable, if no operation panel is used)

Operation panels	**BT**
Intelligent operation panel, Ex ib IIC T6, for mounting on the front	**BT851.0**
Intelligent operation panel, Ex ib IIC T6, with IP65 housing	**BT851.5**
Operation panel, Ex ib IIC T6, for mounting on the front	**BT854.0**
with key-operated switch	**BT854.1**
Operation panel, Ex ib IIC T6, with IP65 housing	**BT855.0**
with key-operated switch	**BT855.1**

Purge medium valve:

(Ex de IIC T4)

Digital **SVD**	**.**	**.**	*Proportional,* suitable for Ex p-housing size	
Continuous flow	.D			
Leakage compensation ..	.L			
Nozzle: 1 mm		.1	**SVP.**	**12**
1,5 mm		.1.5	With 8 mm nozzle	
2 mm		.2		
3 mm		.3		
4 mm		.4		
5 mm		.5		
6mm		.6		

Order mains voltage in plain text (e.g.SVD.L.2 24VDC)

Fuse for solenoid valve

(Ex-version)

$U_{Nominal}$	SVP	SVD
230 VAC, 220 VAC	200mA	100mA
120 VAC, 110 VAC	315mA	160mA
24 VAC, 24 VDC	1,6 A	630mA

Nominal	Order.Nr
100 mA	SI850.0
160mA	SI850.1
200 mA	SI850.2
315 mA	SI850.3
500 mA	SI850.4
630 mA	SI850.5
1000 mA	SI850.6
1600 mA	SI850.7
2000mA	SI850.8

Remark: please order the Ex- solenoid valve fuse separately

6.5 Installation hints

The diagram shows the relationship between the pressure inside of the enclosure and the output flow. The diagram is only valid, without reducing input or output diameters as well as flow reducing pipes network.

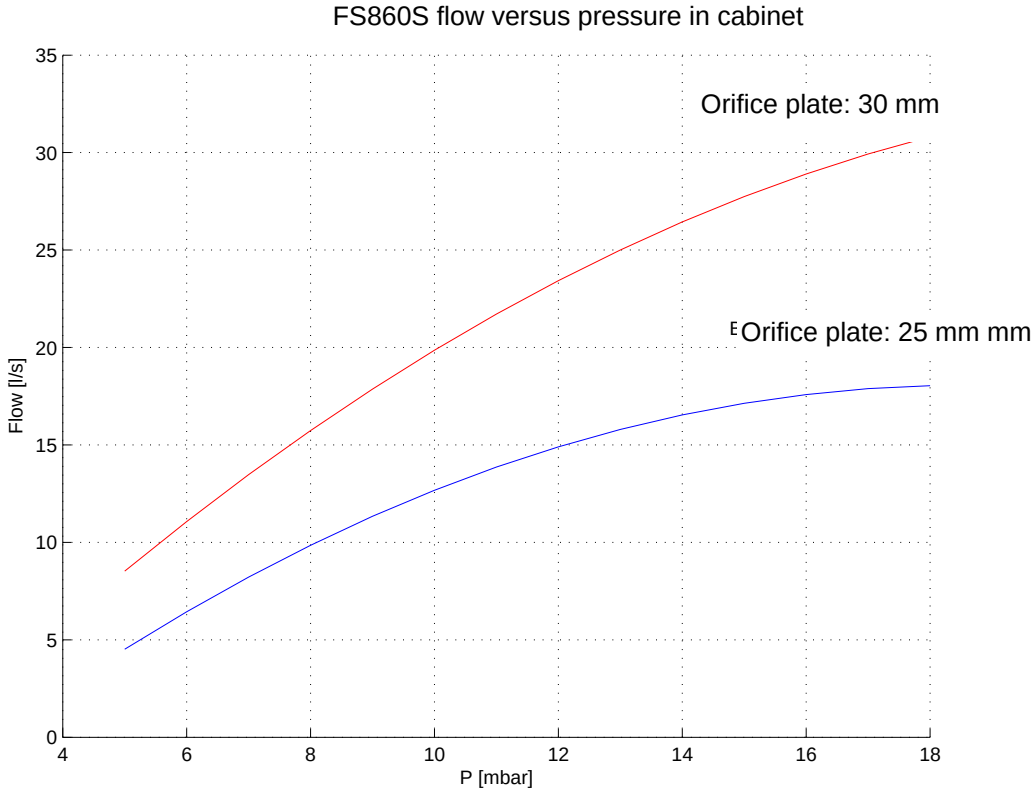


Figure 9: Flow through FS860S versus pressure inside cabinet

6.6 Dimensions

Units: mm

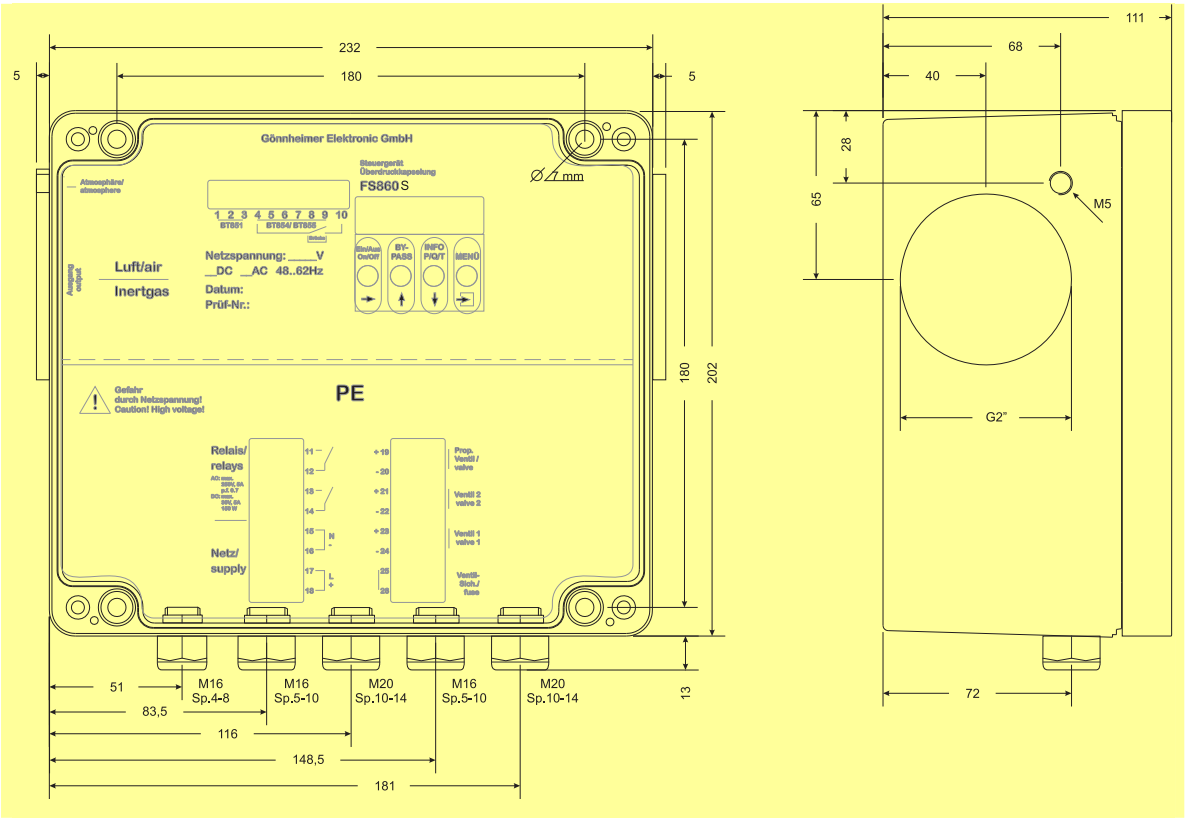


Figure 10: Dimensions FS860S (mm)

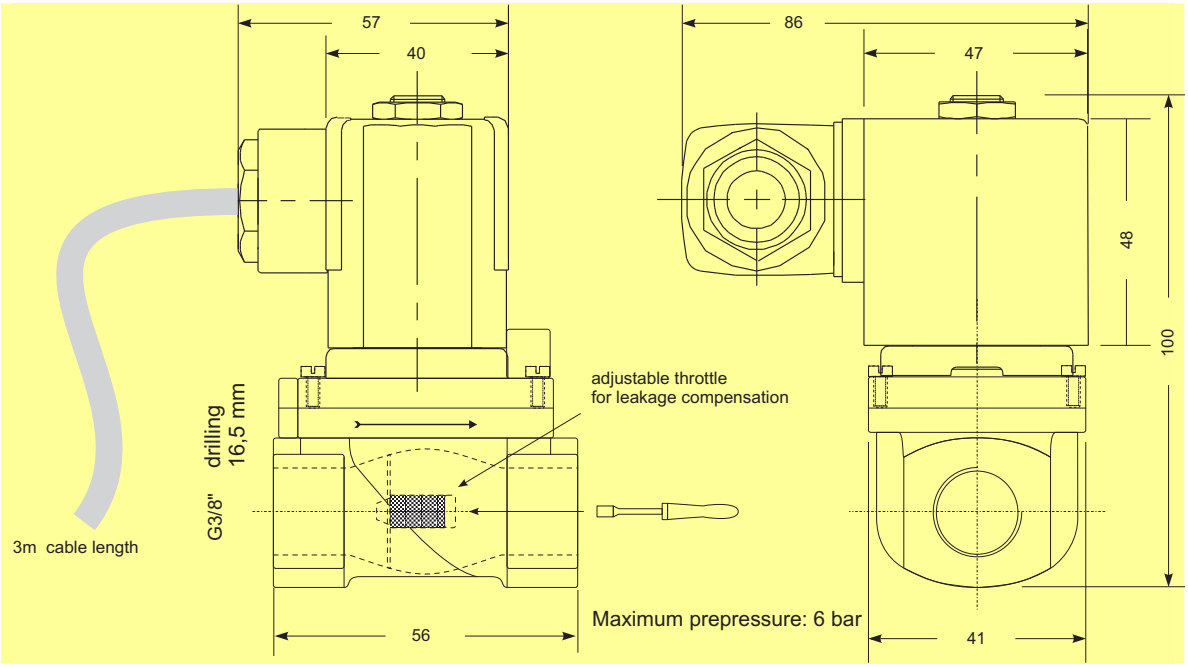


Figure 11: Solenoid valve SVD.L.X (mm)

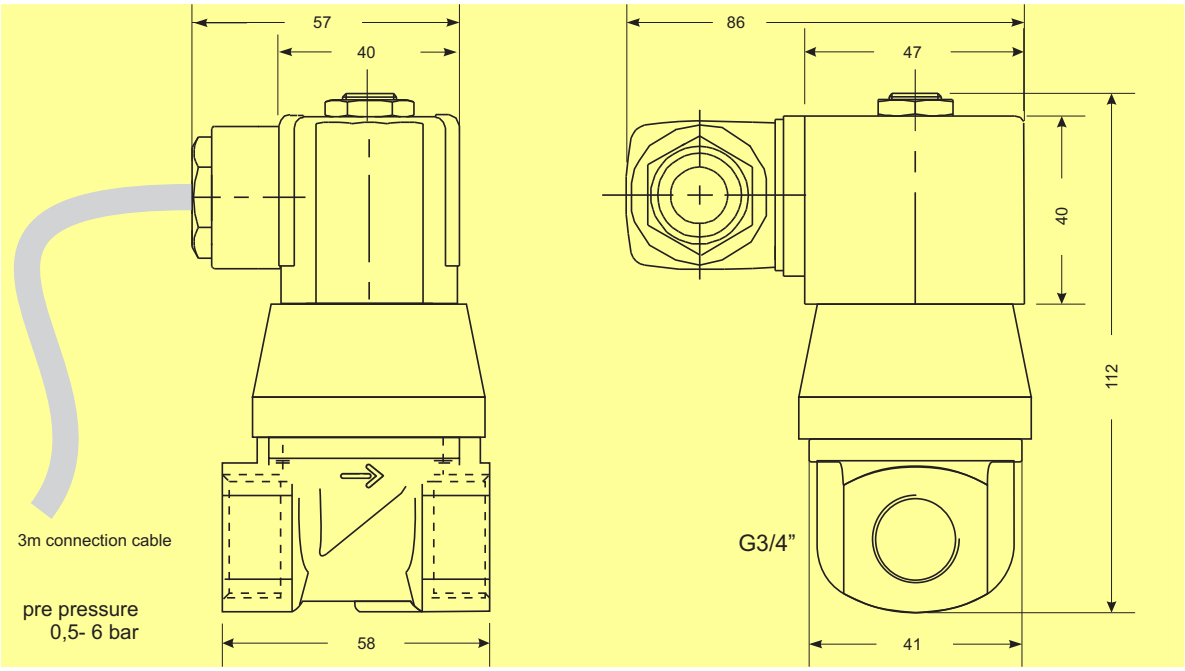


Figure 12: Solenoid valve SVP.12 (mm)

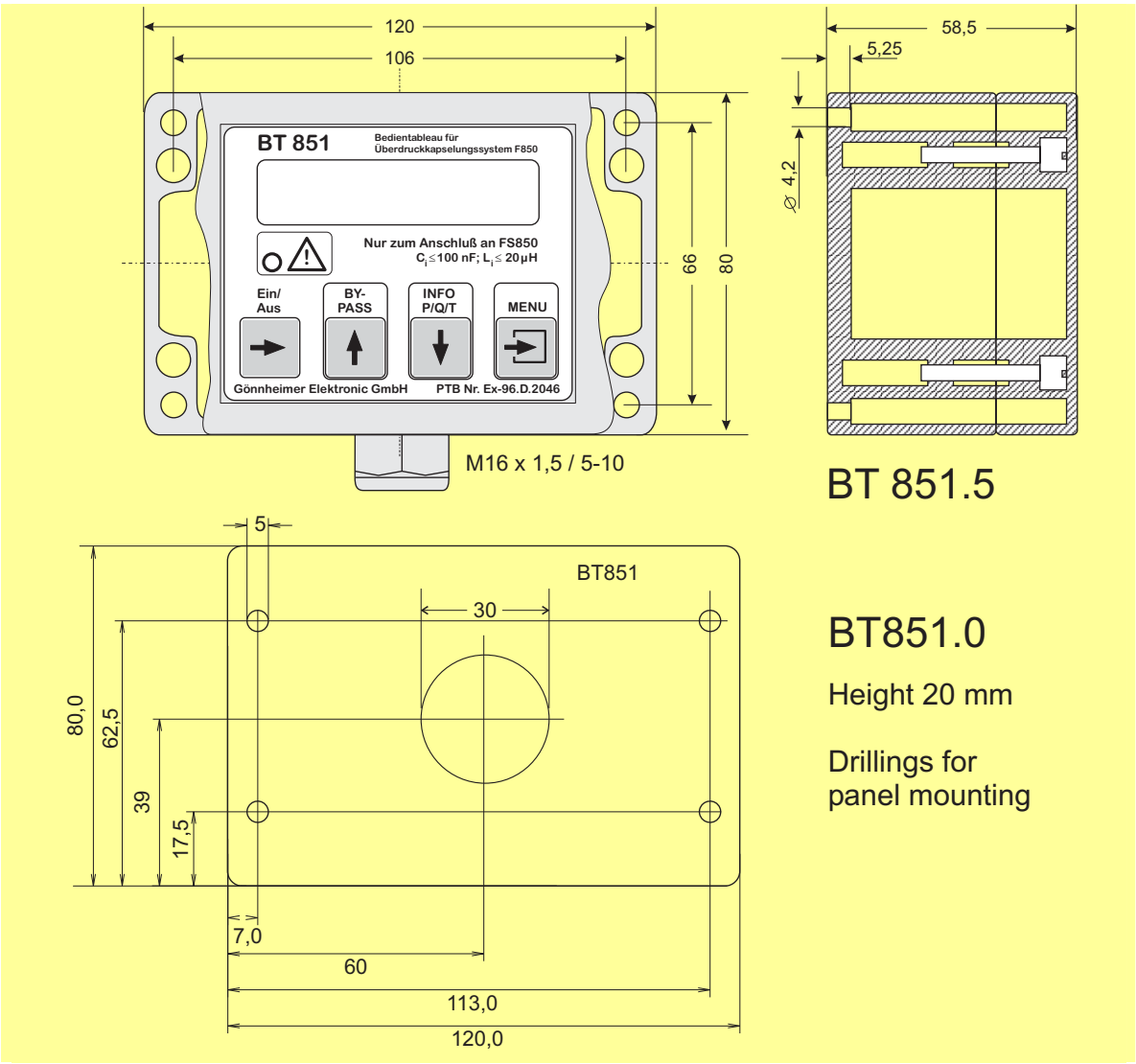


Figure 13: Dimensions Bedientableau BT851.x (mm)

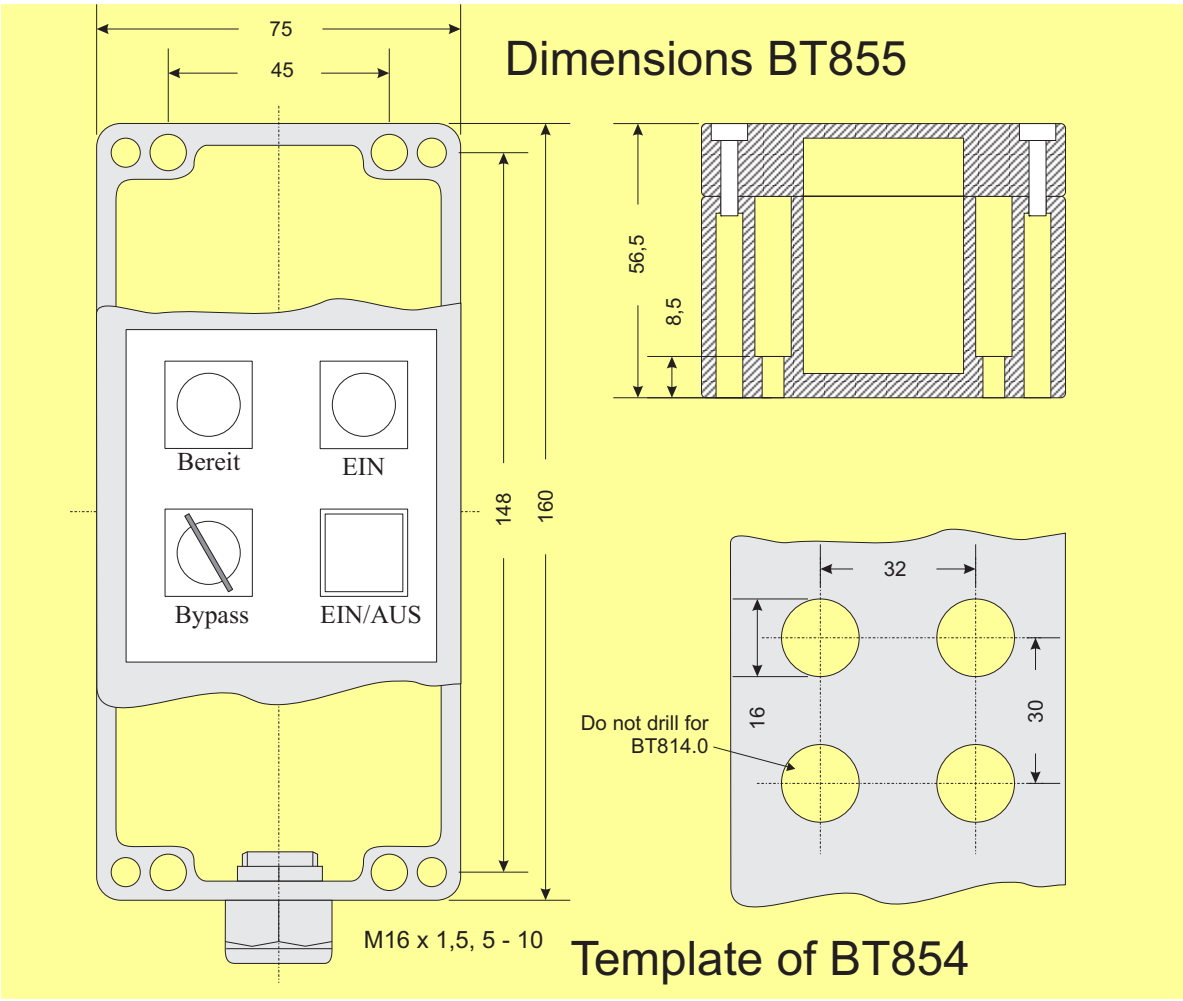


Figure 14: Dimensions Bedientableau BT85x.x (mm)

6.7 Mounting hints

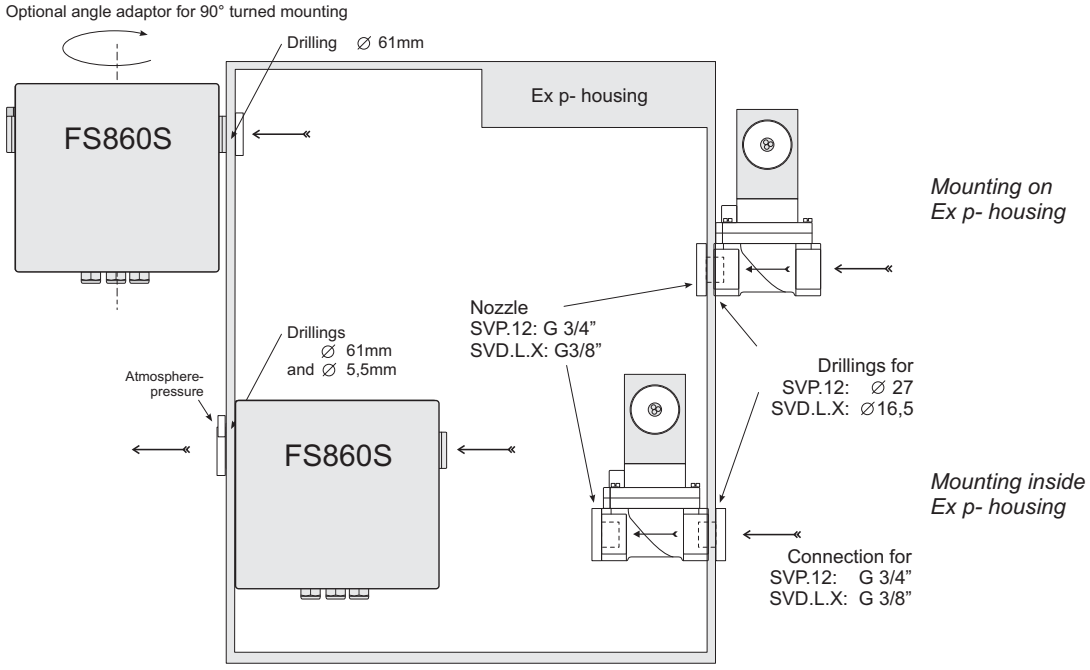


Figure 15: Mounting hints

6.8 List of Parameters

System identification	Installation no.:	Date:	
FS860S. .	Production no.:	Solenoid valve	BT851 Yes - No

Inputs	**Description**	**Display**	**Value/ state**	
Language	F860S language	Language		
Structure				
Valve	Solenoid valve type used with this purging system?	Valves Tick box	P-Valve ❑	D-Valve ❑
Purging method	Time based purging method (Integ N.) or integration purging method (Integ. Y.)	Integra. Tick box	Integ. Y. ❑	Integ. N. ❑
Operational mode	Continuous flow (C. flow Y.) or leakage compensation (C. flow N.)	Cont. Flow Tick box	C. Flow Y. ❑	C. Flow N, ❑
Parameters	Purge time	Pur. Time		
	Purge volume	Pur. Vol.		
	Minimum flow rate during purging procedure	Min. Fl. P.		
	Minimum flow rate during normal operation by op. mode continuous flow	Min.Fl. O.		
	Set-point flow rate by operation mode continuous flow	Rated Fl.		
	Pressure monitor, minimum pressure	Min. Pres.		
	Pressure monitor, maximum pressure	Max. Pres		
	Set-point pressure during purging	R. Pre. Pu.		
	Set-point pressure during normal operation	Rated Pr.		
Codes	Code for main menu	M-Code		
	Code for bypass	By-Code		
	Code to enable switching ignition-capable device	On/Off-C.		

EXAM
BBG Prüf- und Zertifizier GmbH

(1) # EG-Baumusterprüfbescheinigung

(2) **- Richtlinie 94/9/EG -**
Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen

(3) ## BVS 06 ATEX E 088

(4) **Gerät:** **Überdruckkapselungssystem Typ F 850 S und F 860 S**

(5) **Hersteller:** **Gönnheimer Elektronic GmbH**

(6) **Anschrift:** **67433 Neustadt and der Weinstraße**

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) Die Zertifizierungsstelle der EXAM BBG Prüf- und Zertifizier GmbH, benannte Stelle Nr. 0158 gemäß Artikel 9 der Richtlinie 94/9/EG des Europäischen Parlaments und des Rates vom 23. März 1994, bescheinigt, dass das Gerät die grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie erfüllt.
Die Ergebnisse der Prüfung sind in dem Prüfprotokoll BVS PP 06.2078 EG niedergelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 60079-0:2004	Allgemeine Bestimmungen	EN 60079-2:2004	Überdruckkapselung ´p´
EN 60079-7:2003	Erhöhte Sicherheit ´e´	FDIS IEC 60079-11:2005	Eigensicherheit ´i´
EN 60079-18:2004	Vergusskapselung ´m´	IEC 61241-0:2004	Allgemeine Bestimmungen
EN 61241-1:2004	Schutz durch Gehäuse ´tD´	IEC 61241-11:2005	Eigensichere Betriebsmittel
EN 954-1:1996	Sicherheit von Maschinen, Sicherheitsbezogene Teile von Steuerungen		

(10) Falls das Zeichen „X“ hinter der Bescheinigungsnummer steht, wird in der Anlage zu dieser Bescheinigung auf besondere Bedingungen für die sichere Anwendung des Gerätes hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf die Konzeption und die Baumusterprüfung des beschriebenen Gerätes in Übereinstimmung mit der Richtlinie 94/9/EG.
Für Herstellung und in Verkehr bringen des Gerätes sind weitere Anforderungen der Richtlinie zu erfüllen, die nicht durch diese Bescheinigung abgedeckt sind.

(12) Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

II 2G **für FS850S, FS860S und BT 851**
II 2D **für FS850S und BT 851**

Details siehe 15.1

EXAM BBG Prüf- und Zertifizier GmbH
Bochum, den 25. Juli 2006

Zertifizierungsstelle

Fachbereich

Dieses Zertifikat darf nur unverändert weiterverbreitet werden.
Dinnendahlstraße 9 44809 Bochum Telefon 0234/3696-105 Telefax 0234/3696-110

(13) Anlage zur

(14) # EG-Baumusterprüfbescheinigung

BVS 06 ATEX E 088

(15) 15.1 Gegenstand und Typ

Überdruckkapselungssystem Typ F 850 S und F 860 S

Steuergerät Typ FS850S:

	II 2G Ex e mb [ib] [px] IIC T6	-20 °C ≤ T_A ≤ +45 °C
⟨Ex⟩	II 2G Ex e mb [ib] [px] IIC T4	-20 °C ≤ T_A ≤ +60 °C
	II 2D Ex tD [ibD] [pD] A21 IP 65 T 70 °C	-20 °C ≤ T_A ≤ +60 °C

Steuergerät Typ FS850S.*.*.*.HT:

⟨Ex⟩	II 2G Ex e mb [ib] [px] IIC T4	-20 °C ≤ T_A ≤ +70 °C

Steuergerät Typ FS860S:

	II 2G Ex e mb [ib] [px] IIC T6	-20 °C ≤ T_A ≤ +45 °C
⟨Ex⟩	II 2G Ex e mb [ib] [px] IIC T4	-20 °C ≤ T_A ≤ +60 °C

Bedientableau BT 851:

⟨Ex⟩ II 2G Ex ib IIC T6
II 2D Ex ibD 21 T 80 °C

15.2 Beschreibung

Die Überdruckkapselungssysteme Typ F 850 S und Typ F 860 S dienen zum Aufbau von explosionsgeschützten elektrischen Betriebsmitteln in der Zündschutzart Überdruckkapselung nach EN/IEC 60079-2 sowie EN/IEC 61241-4. Sie bestehen aus den Steuergeräten FS 850 S bzw. FS 860 S und dem Bedientableau BT 851 sowie weiteren Zusatzgeräten.

Die Funktionssicherheit des Überdruckkapselungssystems Typ F 850 S wurde auf Grundlage der EN 954 „Sicherheit von Maschinen - Sicherheitsbezogene Teile von Steuerungen" geprüft, es entspricht der Kategorie 3 der genannten Norm.

15.3 Kenngrößen

Netzanschluss (Klemmen 15 bis 18)	230, 220, 120, 110, 24 V AC, bzw. 24 V DC Sicherheitstechnischer Maximalwert Um = 253 V					
Ventilsicherung (Klemmen 25/26)	zugehörige Ventilsicherung Typ SI850					
Ventilanschlüsse (Klemmen 21/22 und 23/24)	Höhe der Spannung wie Netzanschluss					
Proportionalventilanschluss (Klemmen 19/20)	Höhe der Spannung wie Netzanschluss					
Kontaktstromkreise (Klemmen 11/12 und 13/14)	Wechselspannung			Gleichspannung		
	U	=	250 V	U	=	30 V
	I	=	5 A	I	=	5 A
	cosφ	=	0,7	P	=	150 W

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Eigensichere Anschlüsse in Zündschutzart Eigensicherheit Ex ib IIC

Die Höchstwerte, die höchstzulässigen Werte für die äußeren Reaktanzen sowie die zugehörigen Klemmenbezeichnungen sind folgender Tabelle zu entnehmen:

Klemme	U_0	I_0	P_0	L_0	C_0
1,9	8,61 V	51 mA	110 mW	10 mH	2 µF
4	8,61 V	10 mA	22 mW	10 mH	2 µF
3	8,61 V	20 mA	44 mW	10 mH	2 µF
5, 6, 10	8,61 V	6 mA	13 mW		
2	Masseanschluss der Stromkreise				

Die eigensicheren Stromkreise (Klemmen 1 bis 10) sind von allen anderen Stromkreisen bis zu einem Scheitelwert der Nennspannung von 375 V sicher galvanisch getrennt.

Der zulässige Umgebungstemperaturbereich beträgt für die Temperaturklasse T6: -20 °C bis 45 °C und für T4: -20 °C bis 60 °C.
Für das Steuergerät Typ FS850S.*.*.*.HT (nur Temperaturklasse T4) beträgt der zulässige Umgebungstemperaturbereich: -20 °C bis 70 °C.

(16) Prüfprotokoll
BVS PP 06.2078 EG, Stand 25.07.2006

(17) Besondere Bedingungen für die sichere Anwendung
Keine

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BBG Prüf- und Zertifizier GmbH

1. Nachtrag

(Ergänzung gemäß Richtlinie 94/9/EG Anhang III Ziffer 6)

zur EG-Baumusterprüfbescheinigung
BVS 06 ATEX E 088

Gerät: **Überdruckkapselungssystem Typ F 850 S und F 860 S**

Hersteller: **Gönnheimer Elektronic GmbH**

Anschrift: **67433 Neustadt an der Weinstraße**

Beschreibung

Die Steuergeräte des Überdruckkapselungssystems können auch nach den im zugehörigen Prüfprotokoll aufgeführten Prüfungsunterlagen gefertigt werden.

Die grundlegenden Sicherheits- und Gesundheitsanforderungen der geänderten Ausführung werden erfüllt durch Übereinstimmung mit

EN 60079-0:2004	Allgemeine Bestimmungen	EN 60079-2:2004	Überdruckkapselung 'p'
EN 60079-7:2003	Erhöhte Sicherheit 'e'	IEC 60079-11:2006	Eigensicherheit 'i'
EN 60079-18:2004	Vergusskapselung 'm'	IEC 61241-0:2004	Allgemeine Bestimmungen
EN 61241-1:2004	Schutz durch Gehäuse 'tD'	IEC 61241-11:2005	Eigensichere Betriebsmittel
EN 954-1:1996	Sicherheit von Maschinen, Sicherheitsbezogene Teile von Steuerungen		

Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

für Typ FS850S
II 2G Ex e mb [ib] [px] IIC T6 oder
II 2G Ex e mb [ib] [px] IIC T4 und
II 2D Ex tD [ibD] [pD] A21 IP 65 T 70 °C

für Typ FS850S.*.*.*.HT
II 2G Ex e mb [ib] [px] IIC T4

für Typ FS860S
II 2G Ex e mb [ib] [px] IIC T6 oder
II 2G Ex e mb [ib] [px] IIC T4

für Typ BT 851
II 2G Ex ib IIC T6 und
II 2D Ex ibD 21 T 80 °C

Dieses Zertifikat darf nur vollständig und unverändert weiterverbreitet werden.
Dinnendahlstraße 9 44809 Bochum Telefon 0234/3696-105 Telefax 0234/3696-110 E-mail ZS@bg-exam.de

EXAM
BBG Prüf- und Zertifizier GmbH

Prüfprotokoll
BVS PP 06.2078 EG, Stand 23.10.2006

EXAM BBG Prüf- und Zertifizier GmbH

Bochum, den 23. Oktober 2006

Zertifizierungsstelle

Fachbereich

Dieses Zertifikat darf nur vollständig und unverändert weiterverbreitet werden.
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EG-Konformitätserklärung

Declaration of conformity / Déclaration de conformité

Communauté Européenne

Anbieter: *Supplier:* *Fournisseur*	Gönnheimer Elektronic GmbH

Anschrift: *Address:* *Adresse:*	Gewerbegebiet Nachtweide Dr.-Julius-Leber-Straße 2 67433 Neustadt/Weinstraße

Produkt: *Product:* *Produit:*	F860S, Überdruckkapselungssystem

Das oben beschriebene Produkt erfüllt die Schutzanforderungen der folgenden EG-Richtlinien / the product described above complies with the following EG- rules / le produit décrit ci-dessus accomplit CU- réglementations

2004/108/EG, 93/68/EWG, 94/9/EG

und ist konform mit / and is in conformity with / et est conforme á:

EN 60079-0: 2006, Allgemeine Bestimmungen EN 60079-2: 2007, Überdruckkapselung „p“ EN 60079-7: 2007, Erhöhte Sicherheit „e“ EN 60079-11: 2007, Eigensicherheit „i“ EN 60079-18: 2004, Vergusskapselung „m“ IEC 61241-11:2005, Eigensichere Betriebsmittel EN 954-1: 1996, Sicherheit von Maschinen EN 1127-1: 2008, ATEX- Grundnorm EN 61000-6-4: 2007, Fachgrundnorm Störaussendung: Industriebereich EN 61000-6-2: 2006, Fachgrundnorm Störfestigkeit: Industriebereich EN 60947-1: 2008, Niederspannungs-Schaltgeräte

zusätzliche Angaben / additional information / informations supplémentaires:

Qualitätsmanagement- System nach ISO EN DIN 9001:2008 Anerkanntes Qualitätssicherungssystem nach Richtlinie 94/9/EG

EG- Baumusterprüfbescheinigung / EC- Type certification / Attestation d’examen ce de type

BVS 06 ATEX E 088

Diese Konformitätserklärung ist gültig für alle Produkte, die ab dem Datum der Unterzeichnung in Verkehr gebracht werden

Neustadt, den 22.09.2010

Gönnheimer (Geschäftsführer)